# Fixed Ladders Design and Construction

WAC 296-876-600

## Section Contents

**YOUR RESPONSIBILITY:**

**To make sure fixed ladders installed before December 1, 2006, meet design and construction requirements**

**TITLE** **PAGE**





# Fixed Ladders Design and Construction

WAC 296-876-600

## Section Contents





# Fixed Ladders Design and Construction

WAC 296-876-600

## Rule

WAC 296-876-60005

### Design and construction--Fixed ladders installed before December 1, 2006

### You must

- Make sure fixed ladders installed **before** December 1, 2006, meet the requirements of WAC 296-876-60010 through 296-876-60080.

**Note:**

Ladders will be considered to have met the requirements of this section if they meet the design and construction requirements of ANSI A14.3, American National Standard for Ladders-Fixed-Safety Requirements, in effect at the time they are installed.



# Fixed Ladders Design and Construction

WAC 296-876-600

# Rule

WAC 296-876-60010

## Design loads

### You must

- Make sure each ladder is able to support, without failure, the total of the following loads:
  - At least 2 loads of 250 pounds each, concentrated between any 2 consecutive attachments.
  - Any additional concentrated loads of 250 pounds each determined from the anticipated use of the ladder.
  - Anticipated loads caused by all of the following that apply:
    - Ice buildup
    - Winds
    - Rigging attached to the ladder, including the load to be lifted
    - Impact loads resulting from the use of ladder safety devices
- Make sure the design of rails, supports, and fastenings includes:
  - Live loads to be supported by the ladder

    **and**

  - The weight of the ladder and everything attached to it.
- Consider all live loads to be concentrated at the point or points that will cause the maximum stress on the ladder or structural member.
- Make sure each step or rung is capable of supporting a single concentrated load of at least 250 pounds applied in the middle of the step or rung.
- Make sure the design stresses for wood components of ladders meet the requirements and specifications of ANSI A14.1, American National Standard for Ladders-Portable Wood-Safety Requirements, in effect when the ladder was installed.
- Make sure fastenings are designed to meet the ladder load requirements.



# Fixed Ladders Design and Construction

WAC 296-876-600

## Rule

WAC 296-876-60015

### Pitch

#### You must

- Make sure the pitch of the ladder is no greater than 90 degrees from the horizontal.

**Note:**

- The preferred pitch of fixed ladders is within the range of 75 to 90 degrees from the horizontal. Ladders with a pitch range of 60 to 70 degrees from the horizontal are considered substandard and are only permitted if necessary to meet the installation requirements.
- Fixed stairs are an alternative for installations where a pitch angle of less than 60 degrees is necessary. See Fixed industrial stairs, WAC 296-24-765, in the General Safety and Health Standards, Chapter 296-24 WAC.

WAC 296-876-60020

### Welding

#### You must

- Make sure welding meets the requirements of the ANSI A14.3, American National Standard for Ladders-Fixed-Safety Requirements, in effect at the time the ladder was installed.



# Fixed Ladders Design and Construction

WAC 296-876-600

## Rule

WAC 296-876-60025

### Ladder surfaces

**You must**

- Make sure all parts and surfaces of the ladder are free of splinters, sharp edges, burrs, or projections that may be hazardous to persons using the ladder.



# Fixed Ladders Design and Construction

WAC 296-876-600

## Rule

WAC 296-876-60030

### Rungs, cleats and steps

#### You must

- Make sure rungs have a minimum diameter as follows:
  - Rungs of wood ladders are at least $1\frac{1}{8}$ inches.
  - Rungs of metal ladders subject to unusually corrosive exposures, such as individual metal rungs imbedded in concrete which serve as access to pits and to other areas under floors, are at least one inch.
  - Rungs of all other metal ladders are at least $\frac{3}{4}$ inch.
- Make sure rungs, cleats, and steps are all of the following:
  - Parallel
  - Level
  - Uniformly spaced throughout the length of the ladder
  - Spaced so the distance from the centerline of one rung to the centerline of the next rung does not exceed 12 inches.

**Exception:**

The vertical distance from the ground, floor, or roof at the access level to the first rung may be adjusted within a range of 14 inches.

#### You must

- Make sure the minimum inside clear width of the stepping surface of rungs, steps, or cleats is 16 inches.
- Make sure individual rung or step-type ladders have rungs or steps that are shaped so that a person's foot cannot slide off the end.



# Fixed Ladders Design and Construction

WAC 296-876-600

## Rule

WAC 296-876-60035

### Side rails

**You must**

- Make sure the shape of the side rail:
  - Provides an adequate gripping surface

    **and**
  - Is uniform throughout the length of climb.
- Make sure a side rail that has been spliced to obtain a longer length is at least equivalent in strength to a one-piece side rail made of the same material.



# Fixed Ladders Design and Construction

WAC 296-876-600

## Rule

WAC 296-876-60040

### Clearances

### You must

- Make sure ladders without wells or cages are at least 30 inches from the nearest permanent object on the climbing side, measured perpendicular to the ladder from the centerline of the rungs, cleats, or steps.

**Exemption:**

When unavoidable obstructions are encountered, the minimum perpendicular clearance between the centerline of the rungs, cleats, or steps and an obstruction on the climbing side may be reduced to 24 inches if a deflection device is installed to guide persons around the obstruction.

### You must

- Make sure ladders without wells or cages have a clear width from the nearest permanent object on each side of the ladder of at least 15 inches, measured from the center of the rungs, cleats, or steps.
- Make sure the distance from the centerline of the rungs, cleats, or steps to the nearest permanent object in back of the ladder is at least 7 inches.

**Exemption:**

Fixed ladders in elevator pits may reduce the minimum clearance from the ladder to the nearest permanent object in back of the ladder to 4 ½ inches.

# Fixed Ladders Design and Construction

WAC 296-876-600

## Rule

WAC 296-876-60045

### Step-across distance

**You must**

- Make sure a through ladder at the point of access or egress has a step-across distance, measured from the centerline of the steps or rungs to the nearest edge of the landing area, that is:
  - Not less than 7 inches

    **or**
  - Greater than 12 inches.
- Make sure a side-step ladder at the point of access or egress has a step-across distance, measured from the side rail of the ladder to the nearest edge of the landing area, that is:
  - Not less than 7 inches

    **or**
  - Greater than 12 inches.



# Fixed Ladders Design and Construction

WAC 296-876-600

## Rule

WAC 296-876-60050

### Extensions and grab bars

**You must**

- Make sure the side rails of through or side-step ladders extend 42 inches above the top of the access level or landing platform.

**Note:**

- For a parapet ladder, the access level is:
  - The roof if the parapet is cut to permit passage through it

    **or**
  - The top of the parapet if it is continuous and uncut.

**You must**

- Make sure the extension of a through ladder above the access level or landing platform has:
  - Steps or rungs omitted from the extension

    **and**
  - Clearance between the side rails that is:
    - Not less than 24 inches

      **or**
    - Greater than 30 inches.

**Exemption:**

The maximum clearance between side rails of the extension may be increased to 36 inches if the ladder has a ladder safety device.

-Continued-

# Fixed Ladders Design and Construction

WAC 296-876-600

## Rule

WAC 296-876-60050

### Extensions and grab bars (continued)

#### You must

- Make sure the side rails of through or side-step ladders extend 42 inches above the top of the access level or landing platform.
- Make sure side-step ladders have the steps or rungs and the side rails continuous in the extension.
- Make sure individual rung-step ladders are extended at least 42 inches above the access level or landing platform by:
  - Continuing the rung spacings as horizontal grab bars

    **or**
  - Providing vertical grab bars that have the same lateral spacing as the vertical legs of the rungs.

**Exemption:**

Extensions are not required for individual rung-step ladders with access openings through a manhole or hatch.

#### You must

- Make sure grab bars:
  - Are at least 4 inches from the nearest permanent object in back of the grab bar, measured from the centerline of the grab bar

    **and**
  - Do not extend beyond the rungs on the climbing side of the ladder.

# Fixed Ladders Design and Construction

WAC 296-876-600

## Rule

WAC 296-876-60055

### Hatches

**You must**

- Make sure counterbalanced hatch covers open at least 70 degrees from the horizontal.
- Make sure the inside clear width of the hatch is a nominal 30 inches.
- Make sure the distance from the centerline of the rungs or cleats to the edge of the hatch opening on the climbing side, measured perpendicular to the ladder, is:
  - Not less than 24 inches

    **or**
  - Greater than 30 inches.
- Make sure hatches with clearance on the climbing side of the ladder that is between 24 and 27 inches are fitted with a deflector plate mounted at an angle of 60 degrees from the horizontal.

**Note:**

The springs or other counterbalance mechanisms for the hatch may project into the hatch opening provided they do not reduce clearance to less than 24 inches and a deflector plate is installed to guide persons around the obstruction.

# Fixed Ladders Design and Construction

WAC 296-876-600

## Rule

WAC 296-876-60060

### Platforms

### You must

- Make sure landing platforms for side-step ladders extend at least 30 inches on the climbing side of the ladder.
- Make sure landing platforms are:
  - At least 30 inches wide

    **and**
  - Equipped with standard railings and toeboards placed to allow safe access to the ladder.

**Reference:**

Requirements for standard railings and toeboards are in *Railing, toeboards, and cover specifications,* WAC 296-24-75011, the General Safety and Health Standards, Chapter 296-24 WAC.

### You must

- Make sure the top rung or step of the ladder is level with the landing served by the ladder.
- Make sure the spacing from the landing platform to the first rung below the platform of a through ladder is the same as the rung spacing of the ladder.
- Make sure, if two or more separate ladders are used to reach an elevated work area, that the ladders are offset with a platform or landing between them.

**Exemption:**

A platform or landing is not required when a portable ladder is used to reach a fixed ladder on structures such as utility towers and billboards where the bottom of the fixed ladder is elevated to limit access.



# Fixed Ladders Design and Construction

WAC 296-876-600

## Rule

WAC 296-876-60065

### Protective structures and equipment

### You must

- Make sure a cage, well, or ladder safety system is provided if:
  - The length of climb is less than 24 feet

    **and**
  - The top of the ladder is more than 24 feet above the ground, floor, or roof.
- Make sure a ladder with a single length of climb that is equal to or greater than 24 feet is either:
  - Equipped with a ladder safety device

    **or**
  - Uses multiple ladder sections and meets all of the following:
    - Each section is provided with a cage or well.
    - The length of climb of any ladder section is not greater than 50 feet.
    - Each ladder section is offset from adjacent sections.
    - Landing platforms are provided at maximum intervals of 50 feet.

**Exemption:**

During construction activities, a self-retracting lifeline with landing platforms provided at maximum intervals of 150 feet may be used instead of a ladder safety device or multiple ladder sections.



# Fixed Ladders Design and Construction

WAC 296-876-600

## Rule

WAC 296-876-60070

### Cages

**You must**

- Make sure the cage meets all of the following:
  - Extends at least 42 inches above the top of the platform or above the point of access and egress at the top of the ladder.
  - Has provisions for accessing and egressing the platform or the point of access or egress of the ladder.
  - There is at least 27 inches, but not more than 30 inches, from the cage to the centerline of the step or rung at all points except where the cage flares at the bottom of the ladder.
  - The cage is at least 27 inches wide.
  - There are no projections inside the cage.
- Make sure the bottom of the cage is:
  - At least 7 feet but not more than 8 feet above the point of access to the bottom of the ladder

    **and**
  - Flared at least 4 inches all around within the distance between the bottom horizontal band and the next higher band.
- Make sure vertical bars are:
  - Spaced at intervals of 9 ½ inches or less on center around the circumference of the cage

    **and**
  - Fastened to the inside of the horizontal bands.
- Make sure the horizontal bands meet all of the following:
  - The vertical intervals between horizontal bands is not more than 4 feet on center.
  - The horizontal bands of ladders with side rails are fastened to the side rails.
  - The horizontal bands of individual-rung ladders are fastened directly to the structure, building, or equipment.



# Fixed Ladders Design and Construction

WAC 296-876-600

## Rule

WAC 296-876-60075

### Wells

**You must**

- Make sure there is at least 27 inches, but not more than 30 inches, from the centerline of the step or rung to the inside face of the well on the climbing side of the ladder.
- Make sure the inside clear width is at least 30 inches.
- Make sure the well:
  - Completely encircles the ladder

    **and**

  - Is free of projections.
- Make sure the bottom of the wall on the access side is at least 7 feet, but not more than 8 feet, above the point of access to the bottom of the ladder.



# Fixed Ladder Design and Construction

WAC 296-876-600

## Rule

WAC 296-876-60080

### Ladder safety devices

**You must**

- Make sure ladder safety devices and related support systems meet all of the following:
  - Are capable of withstanding, without failure, the test drop of a 500 pound weight for a free-fall distance of 18 inches.
  - The device does not require a person to continually hold, push, or pull any part of the device and allows them to have both hands free to grip the ladder.
  - In the event of a fall, the device:
    - Is activated within 2 feet

      **and**
    - Limits the fall velocity to 7 feet per second or less.
  - Uses a connection between the carrier or lifeline and the point of attachment on the full body harness that is not longer than 9 inches.
- Make sure ladder safety devices with rigid carriers have mountings that:
  - Are attached at each end of the carrier

    **and**
  - Have intermediate mountings that are all of the following:
    - Spaced along the entire length of the carrier in accordance with the manufacturer's recommendations.
    - Installed within one foot below each splice on the carrier.
    - Have a maximum distance between mountings that is 25 feet or less.
- Make sure ladder safety devices with flexible carriers have:
  - Mountings that are attached at each end of the carrier

    **and**
  - Cable guides that are spaced at least 25 feet, but no further than 40 feet, apart along the entire length of the carrier.
- Make sure the design and installation of mountings and cable guides does not reduce the design strength of the ladder.